



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/789,042	02/27/2004	Kie Y. Ahn	1303.050US2	8328
21186 7590 08/30/2007 SCHWEGMAN, LUNDBERG & WOESSNER, P.A. P.O. BOX 2938 MINNEAPOLIS, MN 55402			EXAMINER LANDAU, MATTHEW C	
			ART UNIT 2815	PAPER NUMBER
			MAIL DATE 08/30/2007	DELIVERY MODE PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/789,042

Applicant(s)

AHN ET AL.

Examiner

Matthew C. Landau

Art Unit

2815

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 June 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-45 is/are pending in the application.
- 4a) Of the above claim(s) 20-45 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,3-12 and 14-19 is/are rejected.
- 7) ☒ Claim(s) 2 and 13 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>6/14/07</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after allowance or after an Office action under *Ex Parte Quayle*, 25 USPQ 74, 453 O.G. 213 (Comm'r Pat. 1935). Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, prosecution in this application has been reopened pursuant to 37 CFR 1.114.

Applicant's submission filed on June 14, 2007 has been entered.

Election/Restrictions

Claims 20-45 withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim.

Election was made **without** traverse in the reply filed on January 3, 2006.

Allowable Subject Matter

The indicated allowability of claims 1-19 is withdrawn in view of the newly discovered reference(s) to Kaushik et al. Rejections based on the newly cited reference(s) follow.

Claims 2 and 13 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 7-11 and 19 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claims 7 and 8, the limitation “a reaction chamber containing a substrate” renders the claim indefinite. It is unclear if “a substrate” is intended to be the substrate that was previously defined in the claim, or a different substrate. The limitation “an aluminum containing precursor into a reaction chamber” further renders the claim indefinite. It is unclear if “a reaction chamber” is intended to be the previously defined reaction chamber, or a different reaction chamber. Claim 8 has a similar problem regarding “a reaction chamber”.

Regarding claims 11 and 19, it is unclear if the limitation “the floating gate dielectric containing LaAlO₃” refers to the previously defined LaAlO₃ layer, or if this limitation is intended to define an additionally LaAlO₃ layer. Since the specification does not describe a device having more than one LaAlO₃ layer, it will be considered that LaAlO₃ layer referred to in the above limitation is merely referring to the previously defined LaAlO₃ layer.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

Art Unit: 2815

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 3, 7-12, 14, 18, and 19 are rejected under 35 U.S.C. 102(e) as being anticipated by Kaushik et al. (US Pat. 6,541,280, hereinafter Kaushik).

Regarding claims 1, 7, and 12, Figure 2 of Kaushik discloses a substrate 20; a film 22/24 disposed above the substrate, the film including: LaAlO_3 arranged as a layered structure of one or more monolayers (layer 24); and Al_2O_3 arranged as a layered structure of one or more monolayers (layer 22). Regarding claims 7 and 12, Kaushik disclose the dielectric layer 14/22 is a gate dielectric, and the overlying conductive layer 16/26 is a gate electrode (col. 2, lines 62-65). Therefore, the device inherently has a body region (channel region) between a source region and a drain region. Further regarding claim 7, Kaushik discloses the film is formed by atomic layer deposition (ALD) including: pulsing a lanthanum containing precursor into a reaction chamber containing a substrate; pulsing a first oxygen containing precursor into the reaction chamber; pulsing an aluminum containing precursor into a reaction chamber; and pulsing a second oxygen containing precursor into the reaction chamber (col. 3, lines 15-41). Note that although Kaushik disclose the claimed ALD process, the limitations are in fact merely product-by-process limitations.

Regarding claims 3 and 14, Kaushik discloses the film 24 is substantially amorphous (col. 3, lines 15-17, and col. 4, lines 40-42).

Regarding claim 8, the limitation beginning "wherein pulsing a lanthanum containing precursor into a reaction chamber..." is merely a product-by-process limitation that does not structurally distinguish the claimed invention over the prior art. The patentability of a product

Art Unit: 2815

does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process. *In re Thorpe*, 227 USPQ 964, 966.

Regarding claim 9, the limitation beginning “wherein pulsing an aluminum containing precursor into the reaction chamber...” is merely a product-by-process limitation that does not structurally distinguish the claimed invention over the prior art.

Regarding claim 10, the limitation beginning “wherein pulsing an aluminum containing precursor...” is merely a product-by-process limitation that does not structurally distinguish the claimed invention over the prior art.

Regarding claims 11, 18, and 19, Figure 5 of Kaushik discloses a floating gate 46 situated between the body and the gate 50; a floating gate dielectric 48 disposed on the floating gate, separating the floating gate and the gate, the floating gate dielectric containing the LaAlO_3 arranged as a layered structure of one or more monolayers. Note that in Fig. 5, the dielectric layer is a graded layer that is graded from pure Al_2O_3 at the bottom, to LaAlO_3 in the middle (col. 5, lines 65-67). Therefore, the dielectric layer contains at least one monolayer of Al_2O_3 and at least one monolayer of LaAlO_3 .

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person

Art Unit: 2815

having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 4-6 and 15-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kaushik.

Regarding claims 4 and 15, Kaushik discloses the LaAlO_3 layer has a dielectric constant from 10 to 25 (col. 3, lines 60-65). In the case where the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a prima facie case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976). Further, the claim(s) is(are) prima facie obvious without showing that the claimed range(s) achieve unexpected results relative to the prior art range. *In re Woodruff*, 16 USPQ2d 1935, 1937 (Fed. Cir. 1990). See also *In re Huang*, 40 USPQ2d 1685, 1688 (Fed. Cir. 1996) (claimed ranges of a result effective variable, which do not overlap the prior art ranges, are unpatentable unless they produce a new and unexpected result which is different in kind and not merely in degree from the results of the prior art). See also *In re Boesch*, 205 USPQ 215 (CCPA) (discovery of optimum value of result effective variable in known process is ordinarily within skill of art) and *In re Aller*, 105 USPQ 233 (CCPA 1955) (selection of optimum ranges within prior art general conditions is obvious).

Regarding claims 5 and 16, Kaushik does not explicitly disclose the film exhibits an equivalent oxide thickness from about 1.5 angstroms to about 5 angstroms. However, the claim(s) is(are) prima facie obvious without showing that the claimed range(s) achieve unexpected results relative to the prior art range. *In re Woodruff*, 16 USPQ2d 1935, 1937 (Fed. Cir. 1990). See also *In re Huang*, 40 USPQ2d 1685, 1688 (Fed. Cir. 1996) (claimed ranges of a result effective variable, which do not overlap the prior art ranges, are unpatentable unless they produce a new and unexpected result which is different in kind and not merely in degree from

Art Unit: 2815

the results of the prior art). See also *In re Boesch*, 205 USPQ 215 (CCPA) (discovery of optimum value of result effective variable in known process is ordinarily within skill of art) and *In re Aller*, 105 USPQ 233 (CCPA 1955) (selection of optimum ranges within prior art general conditions is obvious).

Regarding claims 6 and 17, Kaushik does not explicitly disclose the film exhibits an equivalent oxide thickness of less than 3 angstroms. However, the claim(s) is(are) prima facie obvious without showing that the claimed range(s) achieve unexpected results relative to the prior art range. *In re Woodruff*, 16 USPQ2d 1935, 1937 (Fed. Cir. 1990). See also *In re Huang*, 40 USPQ2d 1685, 1688 (Fed. Cir. 1996) (claimed ranges of a result effective variable, which do not overlap the prior art ranges, are unpatentable unless they produce a new and unexpected result which is different in kind and not merely in degree from the results of the prior art). See also *In re Boesch*, 205 USPQ 215 (CCPA) (discovery of optimum value of result effective variable in known process is ordinarily within skill of art) and *In re Aller*, 105 USPQ 233 (CCPA 1955) (selection of optimum ranges within prior art general conditions is obvious).


Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew C. Landau whose telephone number is 571-272-1731. The examiner can normally be reached on 9:00AM - 5:30PM.

Art Unit: 2815

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ken Parker can be reached on 571-272-2298. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.


Matthew C. Landau
Primary Examiner
Art Unit 2815
8/28/07